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Notes on the Distribution and Natural History of Yellow-nosed Cotton Rats (*Sigmodon ochrognathus*) from Greenlee County, Arizona

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Abstract

In Arizona, the Yellow-nosed Cotton Rat (*Sigmodon ochrognathus*) is now known from six counties in southeastern parts of the state. Herein, new distributional records and notes on the natural history are reported for *S. ochrognathus* from Greenlee County. These observations represent an 85 km range extension to the northeast from prior records in the state and represent the northernmost records of occurrence in Arizona. The new records likely represent previously undocumented populations of *S. ochrognathus*, where the species has occurred continuously at low population densities or occurred intermittently in the past during high densities. Further trapping should be conducted to the west and north of this study area, as the species likely has a more widespread distribution in the region.

Key words: Arizona, Greenlee County, Mogollon Plateau, range extension, *Sigmodon ochrognathus*, Yellow-nosed Cotton Rat

Introduction

The Yellow-nosed Cotton Rat (*Sigmodon ochrognathus* V. Bailey, 1902) generally inhabits grassy, rocky slopes on desert mountains of southwestern North America, but the species also occurs in montane flats and alluvial fans when other species of cotton rats are absent (Baker and Shump 1978). In the United States, *S. ochrognathus* has a limited distribution in southwestern New Mexico, western Texas, and southeastern Arizona (Baker and Shump 1978; Findley et al. 1975; Hoffmeister 1986; Schmidly and Bradley 2016; Geluso and Geluso 2020). In Arizona, *S. ochrognathus* originally was known from southern parts of the state near the Mexican border, but now the species has been documented farther north and west in the state (Davis and Dunford 1987). Davis and Dunford (1987) suggested that *S. ochrognathus* has shifted its distribution northward from the 1960s to the 1980s and now is more common than it was in the past. In Arizona, published records for *S. ochrognathus* are reported only from five southeastern counties: Cochise, Graham, Pima, Pinal, and Santa Cruz (Hoffmeister 1986; Davis and Dunford 1987; Davis and Ward 1988), with relatively little known about its natural history in the state (Hoffmeister 1986).

From 2015 to 2017, *S. ochrognathus* was trapped frequently in northern Grant and southern Catron counties in New Mexico, adjacent to Greenlee County in southeastern Arizona (Geluso and Geluso 2020). Yellow-nosed Cotton Rats were documented farther north (Geluso and Geluso 2020) than previously was known in New Mexico (Findley et al. 1975; Cook 1986; Geluso 2009). Due to the proximity to Arizona, *S. ochrognathus* likely also occurred in Greenlee County, as the nearest record in New Mexico was only 10.7 km from the Arizona/New Mexico border (see Geluso and Geluso 2020). Herein, new distributional records and notes on the natural history are reported for *S. ochrognathus* from Greenlee County, Arizona.

METHODS AND MATERIALS

In December 2017, a brief survey was conducted for *S. ochrognathus* in Greenlee County, Arizona. To capture small mammals, Sherman live traps (H. B. Sherman Traps, Inc., Tallahassee, Florida) were set and baited with a mixture of birdseed and rolled oats at several locations. Latitude and longitude of localities were determined with a handheld global positioning system (GPS 12, Garmin International, Olathe, Kansas) using North American Datum 1983 (NAD 83). Traps were set in the afternoon and evening. At some sites, traps were checked shortly after sunset, but all traps were checked and removed the following morning. Most animals captured were released at trap sites, but five *S. ochrognathus* were kept as voucher specimens and deposited in the Sternberg Museum of Natural History (FHSM), Fort Hays State University, Hays, Kansas. Tissue samples were collected from the five specimens and also are housed at FHSM. VertNet.org was queried (last accessed on 16 August 2020) to search for unpublished records of *S. ochrognathus* in more northerly areas in Arizona, such as Greenlee County and northern Graham County, but no specimens were documented in such areas. Names of mammals herein follow Bradley et al. (2014).

Most trapping was conducted along the roadside of Arizona State Route 78, but traps also were set in the floodplain of the San Francisco River in the town of Clifton. Only limited numbers of traps were set at each locality because surface runways and piles of cut vegetation that resembled sign of cotton rats were detected in grassy areas. From prior experiences, if fresh sign is observed, only a few traps are needed along runways to document the presence of cotton rats. Dominant grasses along State Route 78 included Silver Beardgrass (*Bothriochloa laguroides* subsp. *torreyana*), Weeping Lovegrass (*Eragrostis curvula*), Muhly (*Muhlenbergia*), and Johnsongrass (*Sorghum halepense*; Fig. 1). Other plants observed along roadsides included Honey Mesquite (*Prosopis glandulosa*) and Creosote (*Larrea tridentata*). In the floodplain of the San Francisco River, traps were set along the riverbank containing dense stands of Saltcedar (*Tamarix ramosissima*) with an understory of an unknown grass (Fig. 2). Traps also were set farther from the bank in a flat area of the floodplain dominated by Alkali Sacaton (*Sporobolus airoides*; Fig. 3). Widely scattered Honey Mesquite also was present along the bank and flat areas of the floodplain.

Figure 1. The highest elevational site (1,588 m) where the Yellow-nosed Cotton Rat (*Sigmodon ochrognathus*) was captured in Greenlee County, Arizona, in December 2017, along a roadside right-of-way of Arizona State Route 78 (1.2 km S, 18.2 km E Clifton P.O., 33.04410°N, 109.11468°W). Individuals were captured in the grassy area in the foreground. Photograph by Keith Geluso.

Figure 2. The lowest elevational site (1,053 m) where the Yellow-nosed Cotton Rat (*Sigmodon ochrognathus*) was captured in Greenlee County, Arizona, in December 2017 along the San Francisco River (0.4 km S, 1.3 km E Clifton P.O., 33.052168°N, 109.29407°W). An individual was captured in grasses adjacent to the Saltcedars (*Tamarix ramosissima*). Photograph by Keith Geluso.

Figure 3. Dense stand of Alkali Sacaton (*Sporobolus airoides*) in flats near the riverbank of the San Francisco River in Greenlee County, Arizona, where a Yellow-nosed Cotton Rat (*Sigmodon ochrognathus*) was captured in December 2017. Latitude/longitude coordinates and elevation are same as given in Figure 2. Photograph by Kenneth N. Geluso.

RESULTS AND DISCUSSION

From 17 to 19 December 2017, 15 *S. ochrognathus* were captured at five sites with a total of 85 trap nights in Greenlee County, Arizona (7 females and 8 males; Appendix and Fig. 4). Thirteen individuals were captured in grassy areas along roadsides, one individual was captured along the bank of the San Francisco River, and one individual was captured in the sacaton-dominated flats of the floodplain of the San Francisco River. At all sites, cotton rats had constructed surface runways and left piles of grass clippings. Elevations of capture sites ranged as low as 1,053 m along the San Francisco River in Clifton to as high as 1,588 m along Arizona State Route 78 on the southwestern side of the Big Lue Mountains (Figs. 2 and 1, respectively). Body weight of individuals ranged from 36 to 79 g (Appendix). No reproductive activity was documented for females, but females are not known to be reproductively active at northern reaches of their distribution at this time of year (Geluso and Geluso 2020). Males taken as vouchers had testes from 4 to 10 mm in length (Appendix). Other small mammals captured in trap lines with *S. ochrognathus* included the Cactus Deermouse (*Peromyscus eremicus*), Western Harvest Mouse (*Reithrodontomys megalotis*), Western White-throated Woodrat (*Neotoma albigula*), Merriam's Kangaroo Rat (*Dipodomys merriami*), and Bailey's Pocket Mouse (*Chaetodipus baileyi*). Most of these species have been documented with *S. ochrognathus* at other sites throughout its distribution (Hoffmeister 1963; Geluso 2009; Geluso and Geluso 2020).

The capture site of *S. ochrognathus* in the town of Clifton (Site 5; Fig. 4) represents the northernmost record of occurrence for the species in Arizona. The nearest published locality to Site 5 in the state is about 85 km to the southwest near the town of Willcox in

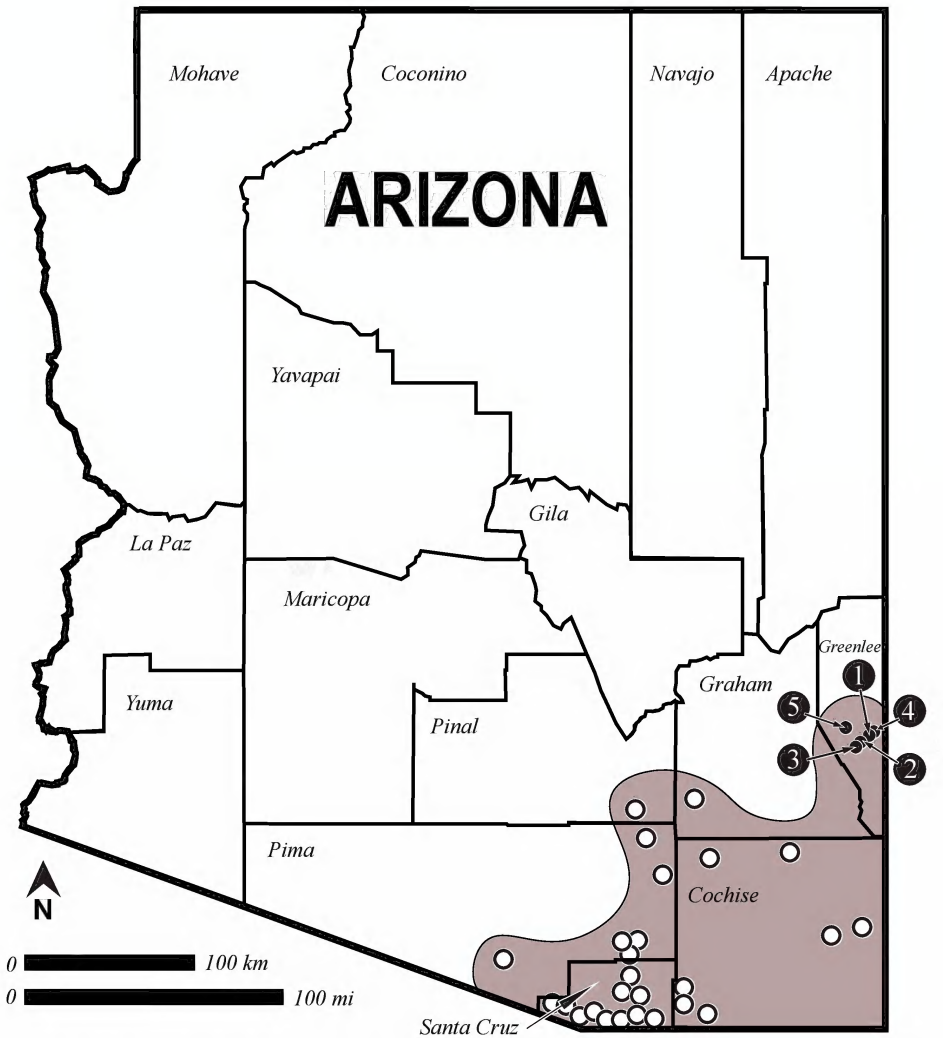

Figure 4. Distribution of the Yellow-nosed Cotton Rat (*Sigmodon ochrognathus*) in Arizona. Closed circles represent five new localities of occurrence in Greenlee County. Sites numbered 1–4 occur along the roadside of Arizona State Route 78, and Site 5 occurs in the floodplain of the San Francisco River in the town of Clifton (see Appendix). Open circles represent previously published records of *S. ochrognathus* in Arizona (Hoffmeister 1986; Davis and Dunford 1987). The shaded area represents the presently known area occupied by *S. ochrognathus* in Arizona.

Cochise County (11 mi NE Willcox; Hoffmeister 1986). However, the nearest published record of *S. ochrognathus* to those in Greenlee County (i.e., the distance from Site 4) is in adjacent Grant County, New Mexico, about 31.1 km to the east along U.S. Highway 180, north of the town of Buckhorn (14.2 km N, 9.7 km W Buckhorn, 33.16458°N, 108.81476°W; Geluso and Geluso 2020). The new localities for *S. ochrognathus* in Arizona represent the first records north of the Gila River in the state. This species also is known to occur north of the Gila River in New Mexico (Geluso 2009; Geluso and Geluso 2020).

Geluso and Geluso (2020) concluded that their recent northern records of *S. ochrognathus* from Grant and Catron counties, New Mexico, represented a range extension and not a range expansion due to limited historical sampling for small mammals in the area. Frey (2009) discusses the use of background data of common species to help distinguish between range expansions and extensions. Background species are those species that should be documented in the same habitats as the species of interest. If background species were present in the past and the species of interest was not documented, then the species of interest likely has newly arrived to the area, and new records should be considered a range expansion. If evidence of background species that should occur in the same habitats cannot be located or verified from the past, then the new locality data for the species of interest should be considered a range extension. Examination of small mammals captured in the past near the collection sites in Greenlee County revealed only a limited number of captures for all rodent species, especially those associated with grassy habitats (Hoffmeister 1986). Thus, the extralimital occurrence of Yellow-nosed Cotton Rats in Greenlee County is best referred to as a range extension (sensu, Frey 2009). However, the possibility exists that this area of occurrence is new for the species (thus, a range expansion), as Davis and Dunford (1987) provided some evidence for an expansion of *S. ochrognathus* into the Santa Catalina Mountains near Tucson.

Species prone to extreme fluctuations in population size are challenging to monitor and to understand occurrences at distributional limits (Frey 2009). Cotton rats experience dramatic spatial-temporal fluctuations in distribution and abundance (Dunnum et al. 2002; Rehmeier et al. 2005; Geluso 2020). Thus, occurrences along or near distributional edges for cotton rats might be periodic or intermittent (Frey 2009). In other words, researchers might fail to detect the occurrence of a species within its distributional limit when in fact it occurs in the area only cyclically, irregularly, or temporarily. Background species that have extreme population fluctuations might not be the best species to use for such purposes (Geluso 2020). The new records of occurrence reported herein likely represent previously undocumented populations of *S. ochrognathus* that have occurred continuously in suitable habitats at low population levels in the past or have occurred periodically in the area only when population densities were high. Although new records of *S. ochrognathus* were documented in Greenlee County, this brief survey did not delineate the distributional limits of the species in the area. Further trapping should be conducted to the west and north of this study area, as the species possibly has a more widespread distribution in the region, especially during years with high populations.

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APPENDIX

Localities of occurrence for the Yellow-nosed Cotton Rat (*Sigmodon ochrognathus*) in Greenlee County, Arizona, December 2017. Numbers in parentheses before each locality correspond to black circles labeled 1–5 in Figure 4. Elevations (elev.) of capture sites were determined by plotting coordinates on Google Earth. Voucher specimens were deposited in the Sternberg Museum of Natural History (FHSM), Fort Hays State University, Hays, Kansas. Reproductive information and body weights in grams (g) are given if data were recorded. Trapping effort (= total trap nights) for each capture site is given along with other species of rodents captured with *S. ochrognathus*.

(1) 2.6 km S, 15.9 km E Clifton Post Office (P.O.), 33.03245°N, 109.13718°W, elev. 1,484 m; 18 December 2017 (1 female [FHSM 43471, no embryos, 49 g]). Other species captured included *Reithrodontomys megalotis* ($n = 1$) and *Peromyscus eremicus* (1). Total trap nights = 14.

(2) 8.7 km S, 11.2 km E Clifton P.O., 32.98013°N, 109.18926°W, elev. 1,210 m; 18 December 2017 (1 male [FHSM 43472, testes 4x2 mm, 43 g]) and 19 December 2017 (1 female [36 g] and 1 male [44 g]). Other species captured included *R. megalotis* (2), *Chaetodipus baileyi* (2), *Dipodomys merriami* (1), and *P. eremicus* (1). Total trap nights = 40.

(3) 11.0 km S, 8.3 km E Clifton P.O., 32.95707°N, 109.22002°W, elev. 1,133 m; 18 December 2017 (1 male [FHSM 43473, testes 7x3 mm, 79 g]) and 19 December 2017 (3 females [40 g; 59 g; and FHSM 43474, no embryos, 65 g] and 2 males [46 g and 70 g]). Other species captured included *P. eremicus* (2) and *Neotoma albigula* (2). Total trap nights = 15.

(4) 1.2 km S, 18.2 km E Clifton P.O., 33.04410°N, 109.11468°W, elev. 1,588 m; 19 December 2017 (2 males [44 g and 39 g] and 1 female [60 g]). No other species captured. Total trap nights = 11.

(5) San Francisco River floodplain in the town of Clifton, 0.4 km S, 1.3 km E Clifton P.O., 33.052168°N, 109.29407°W, elev. 1,053 m; 19 December 2017 (1 male [FHSM 43475, testes 10 x 5 mm, 74 g] and 1 female [no weight recorded]). No other species captured. Total trap nights = 5.

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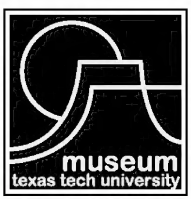

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